Stream Restoration Design Challenges and Status

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What is Restoration?

Restoration Approaches

- Undisturbed Self-Recovery
- Assisted Recovery
- Full Restoration

Pajaro River, CA

- Natural Recovery
- Reference - Based
- Sediment/Riparian Focus
- 5 - 7 Year Recovery
- < $20,000 / Mile

Longs Canyon Creek, CO

- Natural Recovery
- Reference - Based
- Riparian Focus
- 5 - 7 Year Effort
- < $100,000 / Mile

Rapid Creek, SD

- Repair/Reconstruct
- Analytical
- Fisheries & Flood Control
- Aquatic Focus
- Immediate Response
- ~ $500,000 / Mile

Habitat Enhancement

Natural Channel Design

- Emphasizes geometry, plan, profile that will be stable under given flow/sediment regime with minimal armor/maintenance.
- Assumes most functions follow from geomorphic condition.

New-Age Channelization?

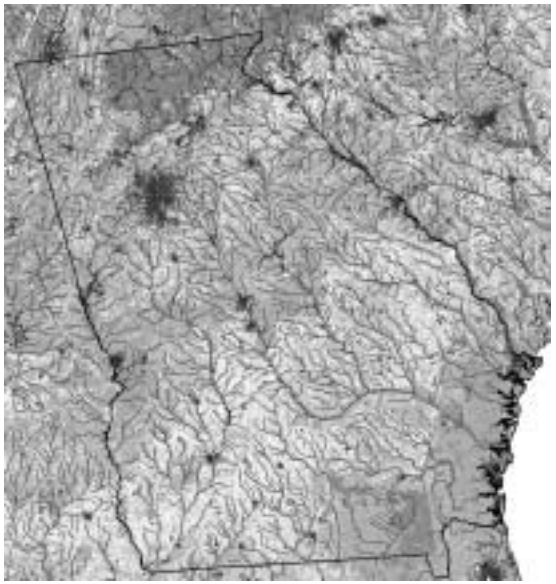
New Paradigm?

- Incorporate ecosystem management principles
- Foster ecological sustainability
- Objective
- Flexible

Stream & Riparian Functions

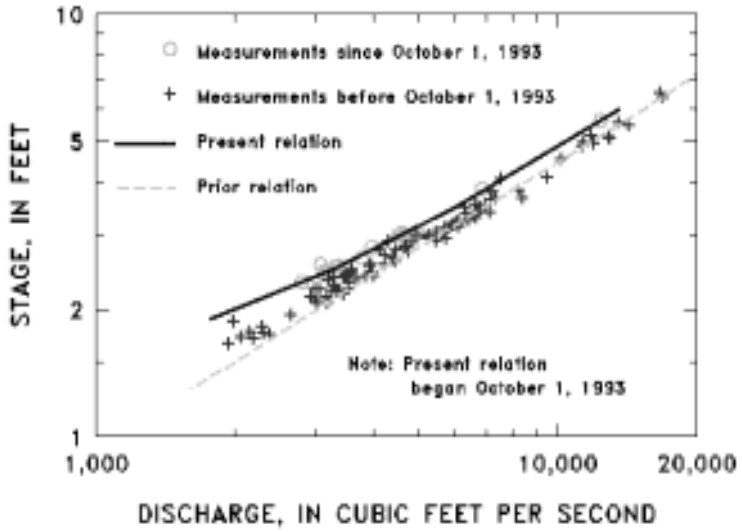
System Dynamics	*Hydrologic Balance*	*Sediment Processes & Character*	*Biological Support*	*Chemical Process & Pathways*
Stream Evolution Processes.	Surface Water Storage Processes.	Full Sedimentation Processes.	Biological Communities and Processes.	Water and Soil Quality Processes.
Energy Processes.	Surface - Subsurface Exchange Processes.	Substrate and Structural Processes.	Necessary Habitats for all Life Cycles.	Chemical Processes and Nutrient Cycles.
Riparian Succession.	Hydrodynamic Character.	Quality and Quantity of Sediments.	Trophic Structures and Pathways.	Landscape Pathways and Processes.

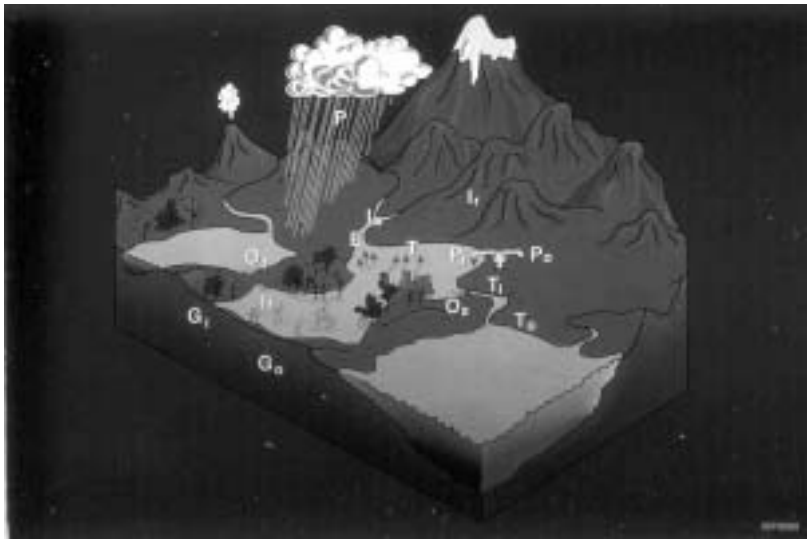
Big Creek, GA

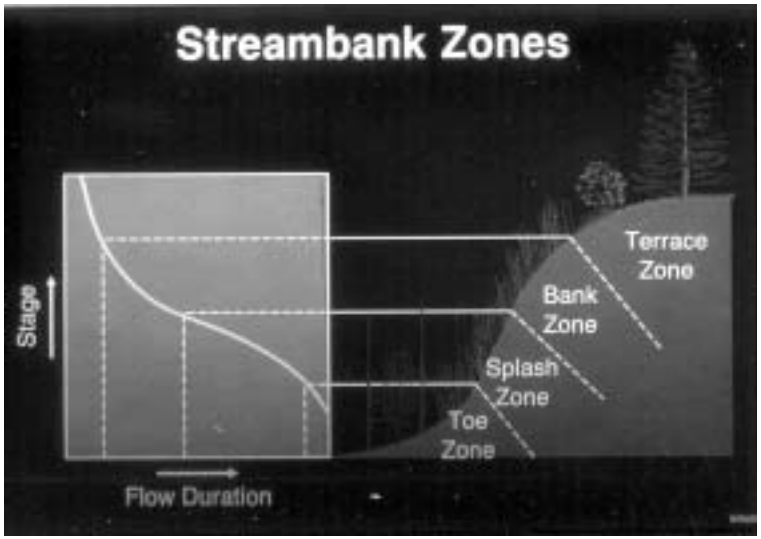


- Multiple Management Options
- Analytical/Reference
- Multi-Year Effort
- ~ $1,000,000 / Mile

Hydrology & Hydraulics

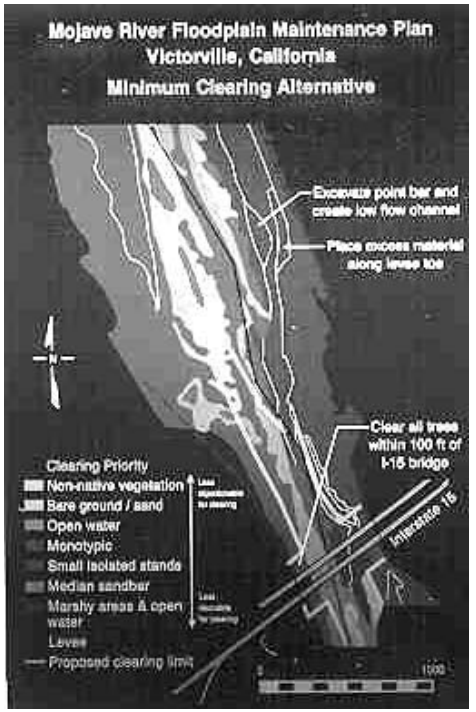




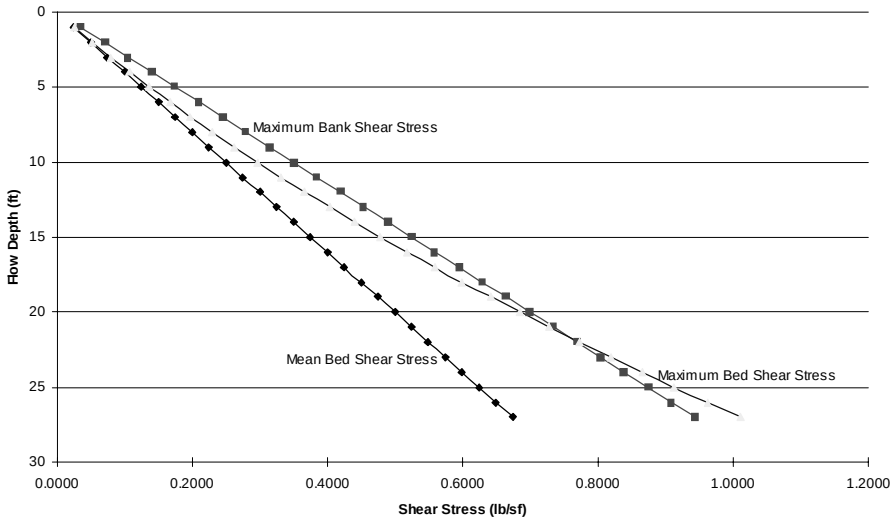


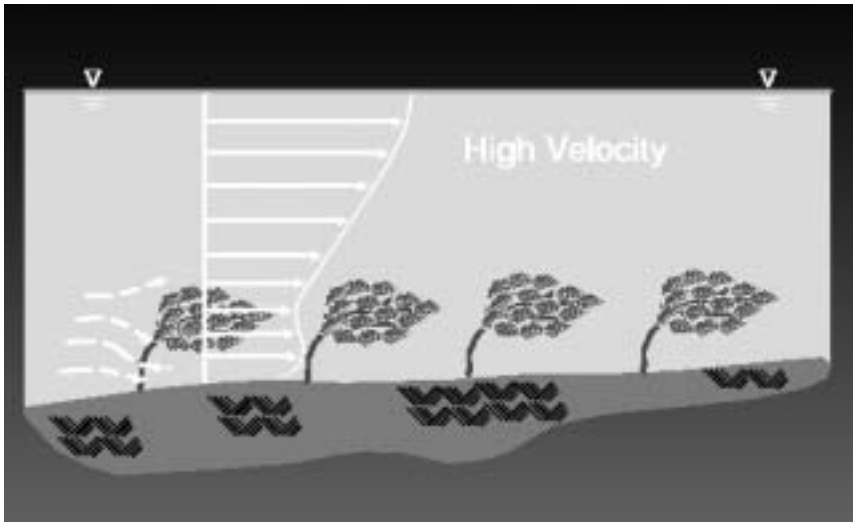
Mojave River, CA

- Riparian Management
- Analytical Basis
- Flood Control Vs Habitat



Stability Analyses





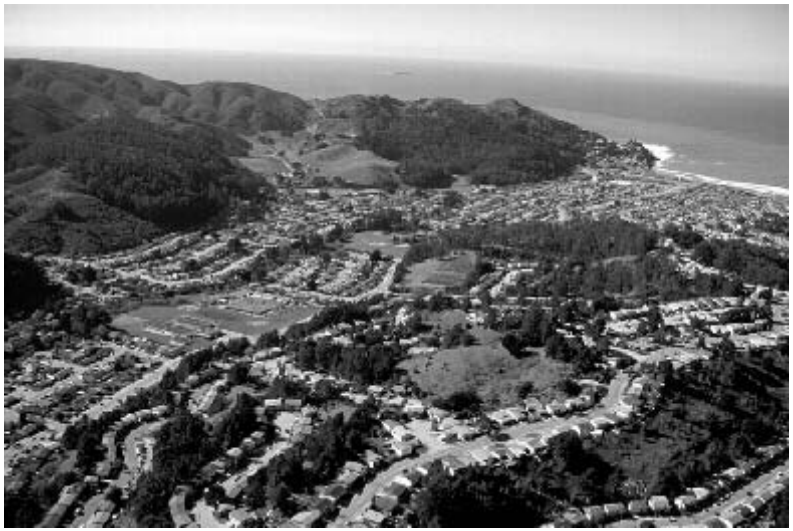
Bitterroot & Clark Fork Rivers, MT
Sacramento & American Rivers, CA

Riprap vs Rootwads

Stable Design Techniques

- Regime Equations
- Analytical Models
  - Threshold
  - Continuity
- Hybrid Approaches

Wildcat Creek, CA



Wildcat Creek, CA (cont'd)

- Reconstruct
- Reference Vs Analytical
- Highly Impacted
- May Never Recover
- > $2,000,000 / Mile

Tools

- Reference Data
- Regime Relations
- H&H Assessments/Models
- Ecological Assessments/Models
- Sediment Assessments/Models
- Stability Assessments
- Water Quality Analyses
- Designs and Specifications
- Common Sense

“Just because a man is an Engineer, it does not mean he knows much about engineering.

It merely means he knows much less about everything else.”

- *Mark Twain*